NON-PUBLIC?: N
ACCESSION #: 8810110262
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Duane Arnold Energy Center (DAEC) PAGE: 1 OF 5

DOCKET NUMBER: 05000331

TITLE: Vibration Transmitter Failure Results in Turbine Trip and Reactor Scram
EVENT DATE: 07/24/88 LER #: 88-008-01 REPORT DATE: 09/30/88

OPERATING MODE: n POWER LEVEL: 081

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Williams W. Douglass, Technical Support Specialist
Ken S. Putnam, Technical Support Engineer TELEPHONE: 319 851-7306

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: IT COMPONENT: VT MANUFACTURER: GO84
REPORTABLE TO NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On July 24, 1988 at 1608 hours the reactor was operating at 81% power when a

reactor scram occurred when a high vibration indication was received for the number ten Journal bearing of the Main Turbine- Generator. Per design the turbine tripped, initiating a rapid closure of the Main Steam Turbine Stop Valves. Stop valve closure indication initiated the reactor scram. All safety systems responded properly and reactor pressure was controlled via Main Steam Bypass Valves to the condenser. Investigation of the cause of the high vibration condition led to the determination that an internal failure had occurred within the vibration detector for the number ten journal bearing. This enabled a spurious signal of a high vibration condition to be generated of sufficient magnitude to exceed the turbine trip setpoint. The vibration transmitter was replaced and the plant successfully returned to power operation on July 27, 1988.

END OF ABSTRACT

I. DESCRIPTION OF EVENT:

On July 24, 1988 at 1608 hours with the reactor at 81% power, a reactor scram occurred due to a Main Turbine-Generator trip caused by an indication of high vibrations sensed at the number ten journal bearing (EIIS System Code IT). As designed, this resulted in energizing the turbine master trip bus and fast closure of the main stop valves followed by rapid closure of the turbine control valves. A reactor scram was generated by the stop valve closure signal. All systems responded per design. All control rods (EIIS System Code AA) were fully
inserted, the Recirculation Pumps (EIIS System Code AD) tripped and the Non-essential Loads (EIIS System Code EA) transferred to off-site power. Main Steam Bypass Valves (EIIS System Code JI) opened and controlled reactor

pressure. Peak reactor pressure was between 1110 and 1117 PSIG and was momentarily reached seconds into the event. No safety relief valves opened as the lowest relief valve setpoint is 1110 PSIG 11 PSIG. As a result of the reactor scram and reactor pressure increase, reactor level momentarily decreased
as expected to approximately 166 inches above the Top of Active Fuel. This initiated a Primary Containment Isolation (EIIS System Code JM) of Groups' 2-5 valves, isolated secondary containment, and started both trains of Standby Gas Treatment (EIIS System Code BH) as expected. Normal feedwater flow restored level promptly with no initiation of Emergency Core Cooling Systems. Reactor pressure and reactor level were restored to normal within 30 seconds after the turbine trip.

II. CAUSE OF EVENT:

The cause of the event was a failure of the vibration transmitter for the number ten journal bearing resulting in a false high vibration indication. The vibration signal increased from its normal range to fifteen mils over a period of thirty seconds during which the turbine trip setpoint (10 mils) was exceeded. The high vibration indication continued for five minutes during turbine coastdown, returning then to normal and eventually to zero.

Inspection of the transmitter noted that minor tapping on the side of the transducer unit yielded a sporadic open coil condition (minimum output). Initial inspection of the internals of the transducer found no obvious indication of degradation. After discussion with vendor representatives, a further examination of the transmitter was performed by Licensee personnel. Two discrepancies were noted which affect the transducer output signal (see attachment 1). A broken contact was found on the wire connecting the center post to the suspension spring. The wire was normally in contact creating

electrical continuity, however, an intermittent open condition could be created which is indicated by loss of output signal. The second discrepancy was a worn threaded fitting by which the center post is attached to a seismic suspension spring. This fitting was sufficiently worn that additional axial movement was possible which would allow greater voltage to be generated for a given

vibratory motion. The voltage increase is electronically sensed as an increase in the magnitude of vibration. It had been noted that during recent operation, a higher than normal vibration had been experienced (between 4 and 7 mils).

The vibration transmitter probe tip normally rides on the surface of the rotating main shaft and communicates radial motion to the transducer. The transducer converts the motion to an electrical signal proportional to the magnitude of the motion. A probe tip modification was suggested by the vendor to ensure that a thick film of oil was not building up under the probe tip as the oiled shaft rotates. The vendor has indicated that the buildup of this oil layer could cause excessive service to the vibration monitor and erroneous vibration readings.

III. ANALYSIS OF EVENT:

As noted in Section I, all systems responded to the event per design. Operators responded to the event properly. The plant was promptly restored to a stable condition with no significant problems encountered. Turbine trips are expected plant transients provided for in plant design. Plant response would have been similar under other initial plant conditions. At higher power levels it is likely that a higher peak pressure would have been reached, a relief valve would have lifted, and wider pressure and level fluctuations would have resulted. A

turbine trip from any licensed power level is an analyzed event.

IV. CORRECTIVE ACTIONS:

The entire vibration monitoring unit was replaced on July 25, 1988. The probe tip on the replacement monitoring unit was modified in accordance with the vendor recommendation. Vibration indications were closely monitored during turbine startup on July 27, 1988, with no unusual vibration readings detected during startup or subsequent power operations. Calibration of all turbine vibration monitor electronic circuits and vibration detectors is scheduled during the Fall 1988 refuel outage.

V. ADDITIONAL INFORMATION:

a. Failed Component Identification

The failed component was a transducer on a vibration transmitter supplied by the General Electric Company (GO84) (EIIS Component Identifier IT-VT-1218K).

b. Previous Similar Events

Plant records indicate there have been two previous instances of turbine trips from high vibration resulting in reactor scrams (October 14, 1977 and October 25, 1983 both events precede current LER reporting requirements). Both of these previous events were as a result of valid high vibration conditions and were not the result of vibration monitoring equipment failure.

FIGURE OMITTED - NOT KEYABLE (DRAWING)

Iowa Electric Light and Power Company

September 30, 1988
DAEC-88-0706

Mr. A. Bert Davis
Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License DPR-49
Licensee Event Report #88-008Rl

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a copy of the revised subject Licensee Event Report.

Very truly yours,

Rick L. Hannen
Plant Superintendent - Nuclear

RLH/WWD/go

cc: U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

NRC Resident Inspector - DAEC

File A-118a

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